

WHAT IS CLAIMED IS:

1. A manufacturing method for an optical element comprising:
  - providing a base member for an optical element and a cutting tool from which a blade tip part protrudes;
  - forming an inspecting groove on a surface of the base member by the blade tip part of the cutting tool by relatively moving the cutting tool and the base member while the cutting tool is rotated;
  - inspecting an inclination of a cut surface of the inspection groove formed by the cutting tool to form an inspection result;
  - correcting an angle defined by the base member and the blade tip part of the cutting tool based on the inspection result; and
  - forming formal grooves on the surface of the base member having the inspection groove by the blade tip part of the cutting tool by relatively moving the cutting tool and the base member while the cutting tool is rotated simultaneously with the inspection groove being cut out.
2. The manufacturing method for an optical element according to claim 1, further comprising:
  - providing the inspection groove with a recessed part and a protruded part formed by the cutting tool; and
  - simultaneously cutting out the inspection groove when the formal grooves which have a recessed part and a protruded part are formed.

3. The manufacturing method for an optical element according to claim 2, further comprising mounting the cutting tool to adjust an inclination of a rotational axis line of the cutting tool such that the angle defined by the base member and the blade tip part of the cutting tool is corrected by adjusting the inclination of the rotational axis line of the cutting tool.

4. The manufacturing method for an optical element according to claim 1, further comprising providing one interval ( $W1+W2$ ) of the recessed part having a width dimension  $W1$  and the protruded part having a width dimension  $W2$  with one pitch of the formal grooves, and a width dimension  $D$  of the blade tip part slightly wider than half ( $1/2$ ) of a pitch ( $W1+W2$ ) of the formal grooves.

5. The manufacturing method for an optical element according to claim 4, further comprising:

setting the width dimension  $D$  of the blade tip part equal to the width dimension  $W1$  of the recessed part and slightly wider than the width dimension  $W2$  of the protruded part; and

repeatedly shifting the cutting tool by half  $((W1+W2) / 2)$  of the pitch in a widthwise direction of the inspection groove to form the formal grooves constituted of the recessed part having the width dimension  $W1$  and the protruded part having the width dimension  $W2$  alternately.

6. The manufacturing method for an optical element according to claim 1, further comprising providing angles which are defined by an edge line extended along a widthwise direction at a lower end edge of the blade tip part and side faces of the blade tip part, substantially equal to each other and set between 90° and 120°.

7. The manufacturing method for an optical element according to claim 1, further comprising correcting an angle defined by the base member and an edge line of the blade tip part of the cutting tool to be  $0 \pm 0.02^\circ$  or less with respect to a prescribed designed angle for the inspection groove.

8. A manufacturing method for an optical element comprising:  
providing a base member for a molding die for an optical element and a cutting tool from which a blade tip part protrudes;

forming an inspection groove on a surface of the base member by the blade tip part of the cutting tool by relatively moving the cutting tool and the base member while the cutting tool is rotated;

inspecting an inclination of a cut surface of the inspection groove formed by the cutting tool to form an inspection result;

correcting an angle defined by the base member and the blade tip part of the cutting tool based on the inspection result;

forming formal grooves on the surface of the base member having the inspection groove by the blade tip part of the cutting tool by relatively moving the cutting tool and the base member while the cutting tool is rotated

simultaneously with the inspection groove being cut out; and

manufacturing the optical element formed in a recessed and protruded shape using the molding die with the formal grooves.

9. The manufacturing method for an optical element according to claim 8, further comprising:

providing the inspection groove with a recessed part and a protruded part formed by the cutting tool; and

cutting out the inspection groove simultaneously when the formal grooves which have a recessed part and a protruded part are formed.

10. The manufacturing method for an optical element according to claim 9, further comprising mounting the cutting tool to adjust an inclination of a rotational axis line of the cutting tool such that the angle defined by the base member and the blade tip part of the cutting tool is corrected by adjusting the inclination of the rotational axis line of the cutting tool.

11. The manufacturing method for an optical element according to claim 8, further comprising providing one interval ( $W1+W2$ ) of the recessed part having a width dimension  $W1$  and the protruded part having a width dimension  $W2$  with one pitch of the formal grooves, and a width dimension  $D$  of the blade tip part slightly wider than half ( $1/2$ ) of a pitch ( $W1+W2$ ) of the formal grooves.

12. The manufacturing method for an optical element according to claim 11, further comprising:

setting the width dimension D equal to the width dimension W1 and slightly wider than the width dimension W2; and

repeatedly shifting the cutting tool by half  $((W1+W2)/2)$  of the pitch in a widthwise direction of the inspection groove to form the formal grooves constituted of the recessed part having the width dimension W1 and the protruded part having the width dimension W2 alternately.

13. The manufacturing method for an optical element according to claim 8, further comprising providing angles which are defined by an edge line extended along a widthwise direction at a lower end edge of the blade tip part and side faces of the blade tip part, substantially equal to each other and set between 90° and 120°.

14. The manufacturing method for an optical element according to claim 8, further comprising correcting an angle defined by the base member and an edge line of the blade tip part of the cutting tool to be  $0 \pm 0.02^\circ$  or less with respect to a prescribed designed angle for the inspection groove.

15. An optical element comprising:

a base member;

an inspection groove formed on a surface of the base member by a blade tip part of a cutting tool by relatively moving the cutting tool and the

base member while the cutting tool is rotated, the inspected groove has an inspected inclination of a cut surface formed by the cutting tool and a corrected angle defined by the base member and the blade tip part; and

formal grooves formed on the surface of the base member having the inspection groove by the blade tip part of the cutting tool by relatively moving the cutting and the base member while the cutting tool is rotated simultaneously with the inspection groove being cut out.

16. The optical element according to claim 15, wherein the inspection groove includes a recessed part and a protruded part formed by the cutting tool and the inspection groove is simultaneously cut out when the formal grooves are formed.

17. The optical element according to claim 16, wherein the cutting tool is mounted so as to adjust an inclination of a rotational axis line of the cutting tool such that the angle defined by the base member and the blade tip part of the cutting tool is corrected by adjusting the inclination of the rotational axis line of the cutting tool.

18. The optical element according to claim 15, wherein one interval ( $W1+W2$ ) of the recessed part having a width dimension  $W1$  and the protruded part having a width dimension  $W2$  is one pitch of the formal grooves, and a width dimension  $D$  of the blade tip part is slightly wider than half ( $1/2$ ) of a pitch ( $W1+W2$ ) of the formal grooves.

19. The optical element according to claim 18, wherein the width dimension D of the blade tip part is set to be equal to the width dimension W1 of the recessed part and slightly wider than the width dimension W2 of the protruded part, and the cutting tool is repeatedly shifted by half  $((W1+W2)/2)$  of the pitch in a widthwise direction of the inspection groove to form the formal grooves constituted of the recessed part having the width dimension W1 and the protruded part having the width dimension W2 alternately.

20. The optical element according to claim 15, wherein angles which are defined by an edge line extended along a widthwise direction at a lower end edge of the blade tip part and side faces of the blade tip part, substantially equal to each other and set between 90° and 120°.